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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|-------------|----------------------|---------------------|------------------|
| 10/650,265 | 08/28/2003 | Benedict G. Pace | NH-09b | 6586 |
| 28920 | 7590 | 03/08/2006 | EXAMINER | |
| JOHN F. MCCORMACK 116 MILBURN LANE ROSLYN HEIGHTS, NJ 11577 | | | MANGRUM, AMY | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2812 | |

DATE MAILED: 03/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--------------------------------------|--|--|
| Office Action Summary | Application No. 10/650,265 | Applicant(s) PACE, BENEDICT G. | |
| | Examiner Amy Mangrum | Art Unit 2812 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 28 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 54-71 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 54-57, 60 and 61 is/are allowed.
- 6) ☒ Claim(s) 59, 62, 63 and 66-71 is/are rejected.
- 7) ☒ Claim(s) 58, 64, 65 and 69 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>12/29/2003</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

The information disclosure statement submitted on 29 December 2003 has been considered.

Claim Objections

Claims 58 and 69 are objected to because of the following informalities:

As to **claim 58**, line 4 the claim recites electromechanical devices. However, based upon dependent claim 59, the claim should recite MEMS. Please add - - micro - - in front of "electromechanical" in line 4.

As to **claim 69**, line 3 the claim recites electromechanical devices. However, based upon dependent claim 70, the claim should recite MEMS. Please add - - micro - - in front of "electromechanical" in line 3.

(Applicant note: In line 1 of claims 59 and 70, the applicant has recited "miniature". However, the accepted nomenclature for MEMS is "micro". The applicant is advised to change "miniature electromechanical" to - - microelectromechanical - -. This will overcome the lack of antecedent basis rejection as noted below.)

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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Claims 59 and 70 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 59 recites the limitation "miniature electrochemical system" in Lines 1-2.

There is insufficient antecedent basis for this limitation in the claim.

Claim 70 recites the limitation "miniature electrochemical system" in Lines 1-2.

There is insufficient antecedent basis for this limitation in the claim.

(See applicant note under allowable subject matter heading below)

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

Claims 62 and 63 are rejected under 35 U.S.C. 102(e) as being anticipated by MacKay et al. (6,293,456 B1).

As to **claim 62**, Mackay et al. describes forming solder balls on contact pads without having the solder metal overlap onto the other pads. (See Fig. 3A) MacKay et al. further describes melting the metal, which when cooled forms spherical shapes on the contact pads (See Figs. 3E-3H, See also Col. 15, Lines 14-23).

As to **claim 63**, MacKay et al. describes the metal being deposited by means of electroplating (See Col. 2, Lines 32-40).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 66-68 are rejected under 35 U.S.C. 103(a) as being unpatentable over MacKay et al. (6,293,456 B1) in view of Capote et al. (6,121,689).

As to **claim 66**, MacKay et al. is cited as teaching the limitations of claim 66, as noted above for claim 62. However, MacKay et al. does not teach metallurgically bonding the metal protuberances to the contacts of an electronic device.

However, Capote et al. describes a metal being formed on contact pads to form protuberances similar to that of MacKay et al., and Capote et al. also describes a step

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of heating the solder bumps to attach them to the contact pads of the substrate (See Figs. 10-11, See also Col. 9, Lines 55-60).

It would be obvious to one of ordinary skill in the art, at the time the invention was made to modify the method of MacKay et al. with a step of attaching the solder bumps to the contact pads of the substrate as taught by Capote et al. so as to form an electrical connection between an electronic device and an insulating substrate.

As to **claims 67 and 68**, MacKay et al. teaches thermocompression bonding (i.e. bonding) as noted in the abstract.

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Claim 69 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacKay et al. (6,293,456 B1) and Capote et al. (6,121,689) as applied to claim 66 above, and further in view of examiner's official notice.

As to **claim 69**, MacKay et al. and Capote et al. are cited as teaching all the limitations for claim 69, as noted above for claim 66, except that neither MacKay et al. nor Capote et al. specifically teach the electronic device consisting of active components, passive components, semiconductor dice and electromechanical devices bonded to the protuberances of the substrate. However, it is notoriously well known in the art of semiconductor manufacturing to use components such as active and passive components in manufacturing of semiconductor devices so as to provide a functional semiconductor device. It would have been obvious to one of ordinary skill in the art at

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the time the invention was made to modify MacKay et al. and Capote et al. with a component so as to provide a functional electronic device.

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Claim 71 is rejected under 35 U.S.C. 103(a) as being unpatentable over MacKay et al. (6,293,456 B1) and Capote et al. (6,121,689) as applied to claim 66 above, and further in view of Chen et al. (6,063,647).

As to **claim 71**, MacKay et al. and Capote et al. are cited as teaching all the limitations of claim 71, as noted above for claim 66. However, MacKay et al. and Capote et al. do not teach that the metal being deposited is selected from the group consisting of aluminum, copper, gold, silver and alloys comprising these metals.

However, Chen et al. describes a metal being formed on contact pads similar to that of MacKay et al. and Capote et al., and Chen et al. also describes the metal being selected from aluminum, copper, gold, silver and alloys comprising these metals (See Col. 5, Lines 25-28).

It would be obvious to one of ordinary skill in the art, at the time the invention was made to modify the method of MacKay et al. and Capote et al. with the metal being selected from aluminum, copper, gold, silver and alloys comprising these metals so as to form an electrically conductive bond between the electric device and the substrate.

Allowable Subject Matter

Applicant note: The subject matter of claims 59 and 70 would be otherwise allowable provided the applicant properly amends the claims to overcome the rejections of these claims under 35 USC 112, 2nd paragraph, as noted above.

Claim 64 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims (Claim 65 is dependent upon claim 64).

The prior art of record, and to the examiners knowledge, does not teach or render obvious the limitations of claim 64, particularly characterized by a step of printing a metal powder, then drying the powder in combination with melting the metal powder to later be cooled to form protuberances.

Claims 54-57 and 60-61 are allowed.

The prior art of record, and to the examiners knowledge, does not teach or render obvious the limitations of claim 54, particularly characterized by a step of applying a layer of gold powder, then drying the gold powder in an organic vehicle in combination with melting the gold powder to later be cooled to form protuberances so that they can be bonded to an electronic device.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kinoshita et al. (5,320,769)

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Amy Mangrum whose telephone number is (571) 272-8061. The examiner can normally be reached on Monday-Friday, 8-5, EST.

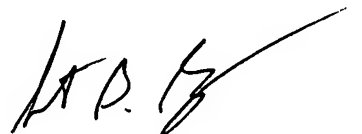
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



2/28/06

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02/28/2006



Primary Examiner
AU 2812
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